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Note by the Secretary-General

Addendum

Discussion paper contributed by the scientific and technological community: science and technology: building the future of the world's forests

Summary

International forest policy deliberations have made progress over the past decade in fostering political commitment on sustainable forest management. In the effective implementation of these commitments the role of science and technology is crucial.

Policy and decision makers should take into full account the potential of markets as means for expressing the full range of values and for distributing the multiple benefits. To this end, it is of vital importance to determine appropriate absolute and relative values for the many benefits provided by forests and to include the real costs of production and distribution in market prices. For this purpose, science and technology should provide and further develop its substantive scientific knowledge on the valuation of forest goods and services and the provision of market and trade-related data and information, and on market-based policy instruments.

There is a strong need for policy and decision makers to adopt a universally accepted definition of forest health. In addition, more appropriate approaches should be used for monitoring and assessing forest health over the medium to long term in

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response to the various natural and anthropogenic stressors. Science and technology should provide and further improve scientific knowledge and technology, addressing the broad range of factors degrading forest health and productivity.

In order to be able to maintain forest cover for present and future generations, policy and decision makers need to address more effectively the various anthropogenic stresses for forest ecosystems and forest biodiversity by means of strengthened dialogue and cooperation with other sectors. In addition, impacts of forestry practices on the roles and functions of forest ecosystems should be addressed. Science and technology has an important role in generating substantive scientific knowledge about the role and functions of forests and the impacts of stresses, as well as new technology for the monitoring, assessment and reporting of forest resources, including remote sensing. All these efforts need to build on adequate capacities of humans and institutions. Therefore, the transfer of technology and the improvement of education and capacity-building continue to be important tasks.

Explanatory note

The international scientific and technological community has been invited by the United Nations Forum on Forests to contribute to its deliberations by means of a major group discussion starter paper for the multi-stakeholder dialogue at the third session of the Forum. For this purpose, the International Union of Forest Research Organizations (IUFRO), the International Council for Science (ICSU) and the Centre de Recherche et d'Action pour le Développement Durable en Afrique Centrale (CERAD) have joined efforts and prepared this paper. Serving as the designated focal point of the major group designated as "scientific and technological community" for the third session of the Forum, IUFRO accepted the task to assume the overall responsibility for the development of the discussion starter paper. The cooperation with the Austrian Government in providing in-kind support for the coordination of this task is acknowledged with appreciation.

Numerous experts from within the scientific and technological communities have contributed to the preparation of the discussion starter paper, aiming to tackle economic aspects of forests and trade, forest health and productivity and the maintenance of forest cover so as to meet present and future needs as comprehensively as possible. However, it is acknowledged that some aspects of particular relevance to the South could have received more substantive consideration, but could not be addressed in greater depth within the short time available.

IUFRO, ICSU and CERAD wish to thank the Forum secretariat for the guidance provided in the development of the paper. It is our sincere hope that the discussion starter paper adequately responds to the information needs of the representatives and delegates to the third session of the Forum and will help to achieve substantial progress on the issues for deliberation. As such, we hope that the paper is one step further in building a better future for the world's forests.

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Contents

		Paragraphs	Page
I.	Background — Science and technology as a basis for sustainable forest management	1–4	5
II.	Substantive element "Economic aspects of forests", including "Trade"	5–22	5
III.	Substantive element "Forest health and productivity"	23–32	9
IV.	Substantive element "Maintaining forest cover to meet present and future needs"	33–43	11
V.	Means of implementation — Technology transfer and capacity-building for sustainable forest management	44–55	13
VI.	National forest programmes — Procedural aspects and supporting factors	56–61	16
VII.	Monitoring, assessment and reporting	62–77	17
VIII.	Final considerations and conclusions	78–82	21

I. Background — Science and technology as a basis for sustainable forest management

1. The international forest policy dialogue since the United Nations Conference on Environment and Development (UNCED) in 1992 has given shape to the multi-dimensional concept of sustainable forest management. Policy instruments have been developed in order to operationalize and further promote this multi-dimensional concept. Ten years after UNCED, the 2002 World Summit on Sustainable Development in Johannesburg reiterated the important role of sustainable forest management for achieving overall sustainable development and the eradication of poverty.

2. However, actual implementation of sustainable forest management remains a daunting challenge, and achieving it requires the fundamental issues be addressed without delay at local, regional and global levels. Most notably, deforestation and forest degradation have continued at a fast rate in several regions of the world, the loss of natural forests in the tropics being estimated to exceed 15 million ha every year. Moreover, concerns about the conservation of forest biological diversity have further increased over the past decade. These developments invariably also affect the availability of forest goods and services and the livelihood of people.

3. In order to address these urgent problems effectively, a better integration of the three dimensions of sustainable forest management, i.e. the ecological, economic and social dimension, has to be achieved by means of participatory and cross-sectoral deliberation mechanisms which integrate the values and needs of different stakeholders and which incorporate existing and new scientific knowledge.

4. At all scales, the role of science and technology is crucial. That community can make a leading contribution to tackling the economic, social and environmental problems connected with sustainable forest management. At the Summit, the scientific and technological community offered a commitment to: (i) make research more policy relevant, (ii) include other stakeholders in broad-based, participatory approaches for a new research agenda, (iii) develop research that integrates the environmental, social and ecological pillars of sustainable development, (iv) assist in improving science education and capacity-building, (v) develop strategies to bridge the North-South divide in scientific and technological capacity, and (vi) help ensure long-term strategies and data needs. If these commitments are implemented and supported, science and technology will be a basis for sustainable development. These general points are also highly relevant for UNFF-3 and the sustainable management of the world's forests.

II. Substantive element "Economic aspects of forests", including "Trade"

Background: role of economic aspects of forests

5. Forests create multiple economic, social, environmental and other benefits for society. Forests offer food, fiber and fuel for large populations. Forests are thus central for rural development and the livelihood of people. For others, forests are important for recreation and tourism. The 2002 Summit emphasized the importance of sustainable forest management often as a critical means to eradicate poverty. On

the other hand, forests are influenced by other sectors and policies in various ways, including industry, energy, tourism, transport and trade policies.

6. The supply of forest goods and services is not without limits, nor can these goods and services be distributed equally to all. The production and allocation of these benefits require trade-offs and create costs. Economics offers help in making trade-offs, whether via the market mechanism or through cost-benefit analysis. Economics also provides guidance on the means of achieving the desired balance of output. Markets and cost-benefit analyses are means of facilitating participation, since stakeholders' values can be included in the balance. Information and transparency are important aspects in this respect.

Crucial issues

7. Given the complexity of the issues involved in forest-related matters, and the differences in contexts and situations across the globe, the international forest policy dialogue has made remarkable progress over the last decade, including a widely shared understanding of sustainable forest management as an overall goal, the main thematic elements that constitute this goal, and a policy deliberation mechanism, i.e., national forest programmes, to include the multiple views on forests in policy-making. However, on the basis of science and technology, a number of key areas can be identified that seem critical for further consideration in forest policy concerning the effective, efficient and equitable allocation of the costs and benefits of forests.

8. It is necessary to enhance efforts aimed at determining appropriate absolute and relative values for each of the many benefits, and some disbenefits, that forests provide (market and non-market). Furthermore, the real costs of production and their distribution should be integrated and reflected in the price as far as possible, so that products are not traded where the full costs of production exceed market values.

9. It is important to review and, if necessary, devise or adjust mechanisms and rules that guide the adequate allocation of the benefits provided by forests within society and over time. This includes many aspects, mechanisms and trade-offs. It is essential to clarify property-rights issues and mechanisms, especially related to common property resources or open-access resources and land tenure rights. Furthermore, all values, including nature conservation, should be included in the production of goods and services. Finally, adequate information bases and mechanisms for decentralized decision-making, as well as adequate price-building mechanisms on markets and mechanisms for allocating non-market exchanged goods and services are also of high relevance for a more effective, efficient and equitable allocation of benefits.

10. Another important challenge is to address trade and environment issues and to assure that trade occurs in ways that promote sustainable forest management. To this end, further work is possible and necessary to develop the potential of certification as one amongst other voluntary economic and information instruments for strengthening sustainable forest management through market mechanisms.

11. There is a need to address the issue of governance, illegal harvesting and associated trade of forest products. Illegal logging occurs on all continents. It directly affects forests at their ecological, economic and social bases. The question is not only theft of goods from the rightful owner, which has an economic impact, but more broadly, the ecological and social impacts of harvesting at places or times

or of species inconsistent with long-term sustainable management objectives. However, unless good governance and poverty are addressed directly, little progress will be made.

12. Significantly more efforts are also required in the light of the commitments made at the Summit concerning the relation between forests and poverty. In this context, the socio-economic and ecological role of agro-forestry should also be further considered by policy and decision makers. Reference can be made to a number of successful projects and studies addressing agro-forestry and involving the use of science and technology.

The role and contribution of the science and technology community

Important contributions of the science and technology community so far

13. The science and technology community has established and further developed a scientifically sound methodical basis for the valuation of forest goods and services. Research has helped identify the values of non-timber forest products and services. These values should be reflected in designing and evaluating management options. However, it seems that outcomes of these valuations have not been widely taken up by policy makers. This is despite the now very well developed methodological toolbox of cost-benefit analysis. When discussing the economic valuation of ecosystem goods and services, adequate attention must be given to defining the spatial and temporal scales of interest.

14. The Millennium Ecosystem Assessment, co-sponsored by the International Council for Science (ICSU) and many other governmental and non-governmental bodies, has prepared a report entitled "People and Ecosystems: A Framework for Assessment and Action". In addition, ICSU is co-sponsor of four global change programmes that form a basis for determining the role of forests in the global climate system and the assessment needs of the United Nations Framework Convention on Climate Change.

15. On the issue of market data and other information related to wood and non-wood forest products, the science and technology community is strongly involved in several efforts in setting up or improving existing information systems for data collection, assessment and reporting. These include the International Union of Forest Research Organizations (IUFRO) Global Forest Information Service (GFIS), as well as collaborative activities in forest resources assessments, climate change policies, biodiversity protection and other areas. ICSU is a co-sponsor of the Integrated Global Observing Strategy (IGOS), which includes the Global Terrestrial Observing System (GTOS). Furthermore, the science and technology community is contributing significantly to the development of outlook studies in different regions of the world through econometric modelling and scenario techniques.

16. The science and technology community has been very active in assisting policy makers in relation to forest certification. Scientists have likewise been key in devising instruments and mechanisms related to common property regimes; they have made major contributions to climate change policies, to the efficient use of wood as a renewable resource for bio-energy, to incorporating forest aspects into rural or community development and tourism, including eco-tourism, and to devising economic or market instruments for biodiversity protection.

The need for further contributions of the science and technology community in the future

17. Further contributions by the science and technology community are needed in the future. Comparatively few contributions have been made in documenting the contribution of forests to the eradication of poverty, e.g. in the context of the water, energy, health, agriculture and biodiversity (WEHAB) framework agreed upon at the Summit.

18. Further contributions are also needed with regard to illegal logging and trade and environment-related issues. In this area, science can help to assure that remedies do not impose hidden costs or disincentives, compounding the adverse impact of illegal logging.

19. Future supply and demand of wood and how they are (and should be) affected by environmental, economic and social constraints form another important topic area where the scientific community can make significant contributions. There are also new factors, such as the potential effect of environmental regulations on realizable supplies and the effect of expanding demand from such players as China in world markets. In developed countries, the result of increasing wealth and public participation has been a move towards greater emphasis on environmental objectives. The situation is different in many tropical countries, with deforestation and degradation of natural forest ecosystems continuing and uncertainty prevailing about whether, given technical and political constraints, plantations are in some instances capable of replacing, quantitatively and qualitatively, the range of goods and services supplied by natural forests.

20. An issue of rising importance is how taxation and subsidies (linked to internalizing non-market effects) conflict with free trade imperatives.

21. Overall, it seems important that the scientific and technical community should continue and enhance its contribution in addressing the economic aspects of forests, including the analysis of the costs and benefits of different options for policies, mechanisms for participation and community development, and revenue collection systems.

Proposed actions for policy and decision makers

22. Policy and decision makers are called upon to:

(a) Take into account the valuation of forest goods and services in developing forest policies. The scientific and technological community should provide scientific knowledge and technical support and carry out further research in support of these aims;

(b) Improve mechanisms to collect, store and disseminate sustainable forest management and market-related data. The scientific and technological community should generate and provide scientific knowledge and technical support for the enhanced provision of information available to all;

(c) Make best use of and further enhance the role of research into the use of economic and policy instruments to facilitate progress towards sustainable forest management and its trade-related aspects, especially in relation to poverty eradication, biodiversity and water protection, renewable materials and renewable energy provision, and climate change mitigation;

(d) Devise policies and instruments that increase the transparency of transactions and promote sustainable production and consumption of forest products. This is critical to improving fairness and equity in markets for forest products, while at the same time contributing to the overall goal of sustainable development. The scientific and technological community can help to design different policies options that are aimed at improving the current situation in both key areas.

III. Substantive element "Forest health and productivity"

Background: multiple factors influence forest health and productivity

23. There are several factors involved in degrading forest capital in ecological, economic and social terms. Air pollution, climate change, forest fires, fragmentation of forests, pests and diseases, and invasive species are among those altered disturbance regimes that have a significant impact on forest health and productivity. Furthermore, forest management activities also influence forest health and productivity.

24. The relevant proposals for action of the Intergovernmental Panel on Forests (IPF)/Intergovernmental Forum on Forests (IFF) give particular emphasis to air pollution as a major threat to forest health. Among the air pollutants affecting forest health at supra-national scales, tropospheric ozone (O_3) is the most pervasive. It can be anticipated that half of the world's forest will be exposed to damaging O_3 levels by 2100. Furthermore, in contrast to the decline in anthropogenic emissions of sulphur dioxide (SO_2) in North America and Europe, SO_2 emissions have been increasing in the rapidly developing countries of Asia, Africa, South and Central America. Southeast Asia now emits more sulphur into the atmosphere than either Europe or North America. At the same time, rainfall acidity arising from the oxidation of sulphur dioxide (SO_2) and nitrogen dioxide (NO_2) has not improved and acidification potential has remained nearly the same, including in northern countries. The increasing atmospheric carbon dioxide (CO_2) concentrations are a main cause of climate change, but are also beneficial to forests.

25. Against the backdrop of changing atmospheric chemistry, there is clear evidence that the world's physical climate is changing. The consensus view among international experts is that anthropogenic influences from outside forestry are strongly implicated.

26. Air pollution has induced changes in tree condition, tree physiology and biogeochemical cycling. It has also lowered tree resistance to insects and disease and affected the function of diverse forest types. Evidence was found in Central Europe already in the 1960s, but no relation was seen in other regions at that time. However, careful retrospective analysis shows that we have not always been successful in relating forest health to air pollution. One of the disadvantages of national and super-national monitoring schemes is "averaging" across regions, leading to a minimization of local changes in tree condition. There has been a tendency to report at these regional scales and, thus, to downplay the importance of point sources. Case studies remain vital to improving the knowledge base and to developing new indicators.

Critical issues

27. Forest health has been defined as "a condition of forest ecosystems that sustains their complexity while providing for human needs". However, it is well accepted that forests respond to stressors in a dynamic and multi-directional way. Stress responses typically become visible in sensitive individuals, then cascade from leaf to branch, to tree, and, ultimately, to the stand and ecosystem levels. Underlying these responses are, therefore, changes in the uptake and allocation of carbon, water and nutrient resources. Currently-used definitions of forest health are likely inadequate to quantify these cause and effect linkages. There is a need, therefore, to develop a universally accepted definition for forest health that incorporates essential processes for which quantifiable endpoints can be measured.

28. During the past decades, developed countries have instituted control programmes to reduce emissions of primary air pollutants and precursor emissions for secondary pollutants such as ozone. Progress has also been made in the evolution of air quality protocols under the Economic Commission for Europe Convention on Long-Range Transboundary Air Pollution and in regional cooperation in monitoring air pollution and its effects among countries in South and South-East Asia. However, limitations to the strength of such programmes accrue from the sampling design adopted. The systematic nature of plot selection may not provide a representative sample of the forests. Data quality is also an issue of concern in crown condition assessment and the spatial and temporal comparability of data. In addition, it is clear that such programmes must be accompanied by supplemental process-oriented investigations that more thoroughly test cause and effect relationships among the stresses and responses of both forests and the biogeochemical processes that sustain them.

29. Finally, it should be re-emphasized that, apart from air pollution, there are many other factors of global or regional significance that are involved in degrading forest health and productivity. As emerging issues, these altered disturbance regimes should receive further attention from forest policy and decision makers in the future.

Role and contribution of the science and technology community

30. Considerable effort has been devoted to enhancing understanding of forest responses to air pollutants by means of international science and technology cooperation and through state-of-science reports and sponsorship of workshops on forest health and productivity. Much work remains, however, to be done in scaling up to landscape in the context of multiple stressors, and in the transfer of generated knowledge.

31. The role of the science and technology community must continue to be, first and foremost, to accelerate understanding of system responses through the investigation of essential processes sustaining health. Secondly, the community must use knowledge from case studies to develop scientifically defensible indicators specific to the stressor of concern. Thirdly, effort put into risk assessment and modelling of outcomes must be enhanced. Fourthly, against the background of decreasing funding levels, the community must demonstrate cost-benefit (improving forest health) from the investments made in emission control and monitoring.

Proposed actions for policy and decision makers

32. Policy and decision makers are called upon to:

(a) Adopt a universally accepted definition for forest health, one that incorporates essential processes and for which quantifiable endpoints can be measured. To this end, the following definition is proposed for consideration:

"Forest health is a measure of its capacity to supply and allocate water, nutrients and energy in ways that increase or maintain ecosystem productivity while maintaining resistance to biotic and abiotic stresses";

(b) Use appropriate approaches to assess forest health in order to improve detection of change over the medium to long term in response to natural and anthropogenic stressors. To this end, the scientific and technological community should generate and provide scientific knowledge and technology, addressing the broad range of factors involved in degrading forest health and productivity.

IV. Substantive element "Maintaining forest cover to meet present and future needs"

Background

33. With a total estimated area of 3,870 million ha worldwide, forests cover about one third of the Earth's land area. They shelter a major part of terrestrial biological diversity and play an important role in providing a potential sink and source for the carbon cycle and in regulating the global climate system through regulating the water cycle. Net primary productivity of forests and other wooded land is estimated to be over half of global terrestrial net primary productivity. As a renewable resource, forests provide a multitude of goods and services for the socio-economic well-being of society, contributing to the livelihood of the rural poor and the eradication of poverty.

34. However, forests and their ability to meet present and future needs are subject to diverse anthropogenic influences creating substantive pressures, such as the continuing expansion of agricultural and pastoral land into tropical rain forests and the strong pressure created by the need for fuel wood in tropical dry forests, both driven primarily by the poverty of local communities. Furthermore, increasing urbanization and mobility of society create new pressures, in particular on temperate forests, such as commuter traffic from suburban areas into urban centres, and tourist activities, etc.

35. Forest ecosystems serve as an important refuge area for many species and communities. They shelter an estimated 80 per cent of all terrestrial species. While some of these species and communities are known, others are still unknown. Several groups of animals (insects, birds, etc.) move between the so-called wild forest compartment and the so-called cultivated agricultural and pastoral compartment. Destruction of these forest compartments can not only impact these movements, but can also disrupt the biological equilibrium in agriculture, such as that between pests and crops. Hence, forest ecosystems need to be preserved for both the conservation of forest biological diversity and the sustainability of the surrounding landscape mosaic.

Crucial issues

36. In order to be able to maintain the capacity of forests to meet the needs of present and future generations, deliberation mechanisms have to be applied that make it possible to integrate the various societal values and needs into policy decisions. Depending on each country's social and legal system, particular emphasis should be given to policy deliberation and negotiation processes that build on mechanisms for the participation of a diverse range of stakeholders. Furthermore, there is a need to strengthen dialogue and cooperation with other sectors, such as agriculture, energy, transportation and tourism.

37. Forest ecosystems are particularly sensitive to anthropogenic factors at the geographic margins of biomes/ecotones, such as forest/savanna limits, savanna/desert limits, upper limits of trees in mountains and the northern limit of boreal forests (permafrost). At these margins rare populations, species, communities and forest types are at the limits of their geographic ranges and often at the limits of their eco-physiological adaptations. However, these rare species add significantly to the species richness and other aspects of biodiversity in such areas. Furthermore, these margins are areas of active evolution. Special efforts should be made, therefore, to maintain viable populations of the rare species in the interests of maintaining biodiversity.

38. Particular emphasis should also be given to the impacts of various forestry practices on forest ecosystems. For instance, clear-cutting normally has a detrimental effect on late-successional and old-growth forest types composed of long-lived, shade-tolerant trees and associated/dependant species. However, these late-successional forest types are recognized as an important component of forest biodiversity. It is a major challenge to develop and implement harvesting and silvicultural practices that protect vulnerable species and forest types in order to maintain the natural diversity of native forest cover types.

39. Due consideration should be given to the question how to make best use of and apply the expertise developed by the forest sector in plantation forestry in the specific context of creating forest environments that serve as a "nurse crop" for the ecological restoration of naturally regenerating native species and forest types. Considerable progress has been made in understanding how to establish forest cover on barren land and how to nurture these plantations to maturity. In applying this expertise in plantation forestry, it is a major challenge to develop restoration protocols aimed at re-establishing native species and forest types in order to develop self-sustaining (e.g., late-successional) forest cover types that meet present and future needs. Forest research contributes significantly to the development of a better understanding of the use, advantages, and also disadvantages, of planted forests as a tool for forest ecosystem restoration.

Role and contribution of the scientific and technological community

40. The scientific and technological community constantly improves scientific knowledge about the role and function of forests, e.g. in relation to biodiversity conservation, and promotes the transfer of such knowledge to policy and decision makers and practitioners. Reference can be made, for example, to the most recent scientific contributions of the International Union of Forest Research Organizations (IUFRO) to a Forum intersessional expert meeting on the theme "The role of planted forests in sustainable forest management: maximizing planted forests" and the

background paper prepared by IUFRO for the multi-stakeholder dialogue at the second session of the Forum.

41. Based on the scientific understanding about the roles and functions of forests, the scientific and technological community contributes to the development and improvement of forest resource monitoring and assessment tools and mechanisms. Significant progress has been made in the further development of remote-sensing technologies and their application for monitoring in conjunction with ground-based measurements. The scientific and technological community also contributes to informing stakeholders about the state of forests and forest cover in terms of quantity and quality.

42. However, there continues to be a clear role for the scientific and technological community in helping to identify forest types and species at risk and about the impacts of forestry practices. It must still be considered a major challenge to develop and implement harvesting and silvicultural practices that protect vulnerable species and forest types in order to maintain the natural diversity of native forest cover types.

Proposed actions for policy and decision makers

43. Policy and decision makers are called upon to:

(a) Strengthen dialogue and cooperation with other sectors, such as agriculture, energy, transportation and tourism, in order to address more effectively the diverse anthropogenic influences creating substantive pressures on forests;

(b) Make best use of and support the further development of scientific knowledge about the role and function of forests and the impacts of forestry practices on these functions; in particular, support the further development of scientific knowledge about the impacts of forest practices on maintaining forest biological diversity;

(c) Further enhance and improve the monitoring and assessment of forest resources in particular in those regions where there is a lack of forest data; for this purpose, make the best use of research and technology, including remote-sensing technologies in conjunction with ground-based measurements, and take strong measures to build and further develop the capacity needed for forest resource monitoring and assessment.

V. Means of implementation: technology transfer and capacity-building for sustainable forest management

Background

44. New scientific knowledge and technology is generated by universities and research organizations throughout the world. Use of current scientific knowledge and technologies are key to promoting and implementing sustainable forest management. The transfer of innovations to potential users requires strategies and investment by multiple stakeholders in order to realize the use of new concepts, information, and technologies.

Scientific information and knowledge as innovations

45. Forest-related innovations are made up of complex sets of information. Scientific credibility is a defining characteristic of such information. Before innovations are adopted, they must be understood by potential users. One way to help them understand complex information is to define the information itself as a product in the context of issues. Information should, therefore, be described in terms of its forest management or policy implications. Related products should be developed and packaged so that they are readily understood and support each other for the purpose of effective applications.

46. The transfer of scientific information can be facilitated when potential users serve as advisers and participants in the research process. Users have a vested interest in assuring that research products meet their needs, and they can help develop, test, and demonstrate innovations. The challenge in this participatory process is for the scientific and technological community to maintain its integrity and objectivity in close proximity to the desires of potential users.

47. Scientific knowledge related to forests is often built over many decades and, as unintended consequences of innovations sometimes emerge, an adaptive approach to implementation can be crucial. The challenge for the transfer of scientific information is to develop ongoing continuity and context setting, requiring significant dedication on the part of science and research organizations and innovation users to the overall benefit to forests and society.

Technologies and intellectual property rights

48. Users can enhance the diffusion of technologies, particularly if they are involved in product development, demonstration, testing and training. Developers have an added incentive for ensuring the application of their innovations when they can be patented. Private industry can ensure widespread use of products through licensing agreements. The protection of intellectual property rights needs to be understood in accordance with relevant international and domestic laws. Concessional and preferential terms as mutually agreed upon can be used as appropriate to facilitate the transfer of technologies among countries, with particular benefit to developing countries. However, the rights of indigenous peoples must be acknowledged and the value of traditional knowledge recognized.

49. The Internet has provided increased awareness of new technologies, concepts, scientific findings and economic information related to forests, forest health and productivity and forest cover to meet present and future needs. The Internet can provide information to new users around the world and improve communications with current users. The Internet also provides means for involving users in the development and delivery of innovations. A challenge for forest-related organizations is to provide easy access, navigation and searching capabilities for users to locate the information and technologies they need. Efforts to develop Internet-based global information systems and networks need, therefore, to be well recognized and supported.

50. One-on-one communication and consultation is often the most effective way to help potential users to come to a decision on using an innovation. Demonstrations are particularly important in transferring innovations related to forest management.

Workshops and courses are learning events that allow participants to receive information in a way that provides context and detail.

Building capacity

51. Given the importance of technology transfer activities for the successful application of innovations and new knowledge at the field level, considerable capacities are needed on the part of scientists and researchers in order to make meaningful contributions to technology transfer processes. Although basic science education must remain as the foundation of research, greater emphasis is now being given to skills and capacities required for technology transfer in all its aspects. Exemplary reference can be made in this context to the work of Centre de Recherche et d'Action pour le Développement Durable en Afrique Centrale (CERAD), which aims to promote the development of scientific knowledge with regard to natural resource management and the use of that knowledge to improve the conditions of the rural poor forest communities in the field.

52. In line with these developments, the forest-related scientific and technological community has been carrying out various activities aimed at expanding and fostering research capacity in developing and economically disadvantaged countries. IUFRO's special programme for developing countries currently develops and offers training modules that are intended to help in consolidating and increasing scientists' knowledge and skills in order to participate in technology transfer activities. CERAD participates in activities on building the capacity of environmental and forestry schools in Central Africa with regard to participatory management of natural resources, indigenous peoples' rights, co-management of forests and fisheries and the development of forestry research in Central Africa.

53. Transfer of technology can also be facilitated by mixing practitioners and scientists from the very start of a project or technology development process. This is particularly relevant in the field of criteria and indicators, auditing of sustainable forest management and forest certification. Currently, training modules in these fields are being developed with special emphasis on skills needed by scientists to successfully participate in criteria and indicators processes, act as auditors of sustainable forest management and/or assist in developing forest certification schemes and their implementation.

54. Another challenge in technology transfer is associated with the access and dissemination of information. Following the call for greater integration and sharing of information at the global scale, the development of the Global Forest Information Service (GFIS) has been initiated. In order to enhance participation of developing countries scientists in GFIS, SPDC provides support to research institutions in the establishment of the system and training of staff. In a broader context, new training modules are being developed that focus on the use of modern information technology in forest research and technology transfer so that scientists apply these information technology tools in their day-to-day work.

Proposed actions for policy and decision makers

55. Policy and decision makers are called upon to:

(a) Promote the diffusion of key information and technology to the full array of potential users and support efforts to strengthen multi-directional communication,

partnership, networking and participation between developers and potential users of innovations in the context of the benefit or outcome desired, including through North-North, North-South and South-South cooperation and partnerships;

(b) Expand the definition of potential users to include organizations, communities, and individuals in different countries, including developing countries, and strongly promote the use of global Internet systems related to forests as a key method for disseminating information in order to create awareness of innovations across the world;

(c) Further strengthen and support capacity-building in forest higher education and research and transfer of technology, including through North-North, North-South and South-South cooperation and partnerships, aiming at a better diffusion of innovative ideas and new knowledge for implementation at the field level.

VI. National forest programmes — procedural aspects and supporting factors

Background

56. The international forest policy dialogue since UNCED 1992 has agreed on actions to promote the sustainable management, conservation and sustainable development of all types of forests, in short: sustainable forest management. Many of the proposals for action of the Intergovernmental Panel on Forests/Intergovernmental Forum on Forests refer to national forest programmes for their implementation.

Crucial issues

57. In its essence, a national forest programme is a political planning instrument for ensuring sustainable forest management by making substantive contributions to (i) economic aspects of forests, including the role of forests in poverty eradication; (ii) forest health and productivity; and (iii) the maintenance of the forest cover to meet present and future needs. This is to be accomplished by a new paradigm of governance, based on interconnecting policy networks instead of hierarchical governance by the State; public participation of all relevant actors and stakeholders in the planning and communication process instead of technocratic decision-making; adaptive, open-ended and iterative learning processes instead of deterministic goal achievement; and comprehensive, holistic and intersectoral coordination of political actors, making sure that all sectors affecting forestry and affected by forestry are considered and externalities are internalized.

58. Essential preconditions for the success of policy networks are communication and trust among the actors. They provide additional informal linkages through information, persuasion, experience and so on, and thereby help produce the collectively desired outcome. Furthermore, the members agree on specific rules, norms and values for achieving the common goal. There is agreement on the basic elements of which a number serve in the resolution of specific coordination problems (e.g., public participation, intersectoral coordination, adaptive and iterative planning). National forest programmes are substantive if they fulfil the

basic elements and contribute to sustainable forest management; otherwise, they are symbolic.

Role and contribution of the scientific and technological community

59. The main objective of the scientific and technological community is to provide policy makers with approved means for formulating and implementing national forest programmes. Though there is broad consensus on the desirability of a national forest programme for anticipatory regulation of conflicting economic, ecological and social interests in forests at the national level, many questions remain on how to proceed in detail.

60. In order to voice and answer these questions, a collaborative research action addressing national forest programmes in a European context and involving 21 European countries was launched in 1999. As there is no operational definition of a national forest programme, the research action focused on the main elements of national forest programmes, such as public participation, intersectoral coordination and adaptive and iterative planning, and developed a series of propositions on the impact of various internal factors (characteristics of participants, process characteristics and content characteristics) and external factors (political culture, ownership structure, financial incentives, legal aspects, etc.) on national forest programmes. Some of these factors can be modified by the intervention of relevant policy makers in the short- or medium-term (e.g., a number of participants in the national forest programme process), others cannot (e.g., the fragmentation of forest ownership or the organization of forest owners). This kind of information enables actors of national forest programme processes to assess which levers can be manipulated in order to influence national forest programme processes in the desired direction, e.g. to achieve substantive national forest programmes instead of solely symbolic processes and outputs.

Proposed action for policy and decision makers

61. Policy and decision makers are called upon to:

Make best use of scientific knowledge and the results of recent research when formulating and implementing national forest programmes; in particular, take due account of the results of scientific work concerning the influence of external factors as well as actors, procedural aspects and the expected content of substantive national forest programme processes.

VII. Monitoring, assessment and reporting

Background

62. Monitoring, assessment and reporting is one of the principal functions of the United Nations Forum on Forests (UNFF). Overall, monitoring, assessment and reporting aim to facilitate informed decision-making on forest policy and management. In the particular context of the Forum, monitoring and assessing progress at the national, regional and global levels through reporting by Governments and by regional and international organizations, institutions and instruments aim to serve as a basis for the consideration of future actions needed.

63. The multi-year programme of work of the Forum specifies three different areas for monitoring, assessment and reporting: (1) progress in implementation of the Intergovernmental Panel on Forests/Intergovernmental Forum on Forests (IPF/IFF) proposals for action; (2) progress towards sustainable forest management of all types of forests; and (3) review of the effectiveness of the international arrangement on forests.

Crucial issues

64. Experience gained so far has contributed significantly to a more differentiated understanding about the different areas of monitoring, assessment and reporting, as identified in the multi-year programme of work, and the related policy instruments. When further considering this subject in the context of the Forum, a differentiation should be made between the three areas of monitoring, assessment and reporting, the different levels to which they apply and the different actors at which they are directed.

65. Monitoring, assessment and reporting on progress in the implementation of the IPF/IFF proposals for action relate to progress achieved in implementation of international commitments by means of policy-related action, mainly by countries and at the national level, but also by other institutions such as international organizations. Many of the proposals for action of the IPF/IFF refer to national forest programmes which thus appear as an important means for their implementation. Consultations and deliberations are still under way to clarify the issue and to find effective mechanisms for monitoring, assessment and reporting. This is despite the ongoing reporting, e.g. for the third session of the Forum, and the limited time span that is left for the Forum as such.

66. The recent country-led initiative on the theme "Lessons learned in monitoring, assessment and reporting on implementation of the IPF/IFF proposals for action" in March 2003 emphasized the importance of assessing and prioritizing the IPF/IFF proposals for action at the national level. Furthermore, it underlined the need to streamline and formalize monitoring, assessment and reporting on the IPF/IFF proposals for action and pointed out the importance for Governments to collaborate with stakeholders, including the private sector and NGOs, e.g. through national forest programmes.

67. The current emphasis on reducing reporting burdens for countries by streamlining reporting obligations and by intensifying efforts towards the development of common reporting formats and data collection mechanisms is important. Reference can be made in this context to the Task Force on Streamlining Forest-related Reporting established by the Collaborative Partnership on Forests and the initiatives taken by the Commission on Sustainable Development. Nevertheless, it should be kept in mind that reporting is not an end in itself. It is essential to devise mechanisms to transfer knowledge and experience and to enable learning from lessons of the past by all stakeholders. Furthermore, it is important to note that the follow-up on the implementation of political commitments made through monitoring, assessment and reporting, should not be confounded with monitoring progress achieved on the ground.

68. Regarding the second area of monitoring, assessment and reporting, i.e. progress towards sustainable forest management of all types of forests, the Forum stressed the importance of using the framework for criteria and indicators for

sustainable forest management as a basis for reporting. The international forest dialogue paved the way for the broad acceptance and application of criteria and indicators for sustainable forest management as an instrument for monitoring, assessing and reporting on progress towards sustainable forest management at the national level, but increasingly also at the field-unit level. However, the recent International Conference on Criteria and Indicators for sustainable forest management concluded that countries are at different stages of developing, implementing and using criteria and indicators for sustainable forest management. Nonetheless, the experts identified seven common thematic areas in the criteria, which are common to the nine criteria and indicators processes that currently exist, involving more than 150 countries worldwide.

69. The outcomes of the Conference pointed to a number of areas in which further efforts are required with regard to criteria and indicators for sustainable forest management. It was concluded that the cost-effectiveness of monitoring, assessment and reporting activities related to sustainable forest management can be significantly enhanced by using existing mechanisms for data collection and reporting, e.g. in the context of the Global forest resource assessment. This aspect is of particular relevance for matching the country-level use of criteria and indicators with the international reporting requirements on sustainable forest management.

70. As another major aspect, the need for building capacity for national data collection, analysis and reporting has been underlined, in particular with regard to developing countries and countries with economies in transition. It was noted that — despite decade-long efforts to compile data from national sources, notably in the context of the global forest resource assessment of FAO — only few countries are in a position to provide forest data owing to a lack of a permanent forest inventory.

71. Finally, the Forum identified the review of the effectiveness of the international arrangement on forests as the third area for monitoring, assessment and reporting. For this purpose, the Forum at its second session decided on specific review criteria.

Role and contribution of the scientific and technological community

72. The scientific and technological community has been at the onset of developing monitoring, assessment and reporting instruments for sustainable forest management. Reference can be made in this context to the activities of the former IUFRO task force on sustainable forestry and the various initiatives by CIFOR. In maintaining this active role, the scientific and technological community continues to provide scientific expertise for the development of approved means for monitoring, assessment and reporting at various levels, e.g. the further development and improvement of regional, national and subnational sets of criteria and indicators for sustainable forest management. Reference can be made to the scientific advice given to the Ministerial Conference on the Protection of Forests in Europe concerning the development and improvement of the Pan-European Indicators for sustainable forest management.

73. The scientific and technological community also plays an important role in supporting the development of a common understanding of the forest-related terms, concepts and definitions that form the basis for international reporting. The "SilvaVoc Terminology Project" serves as a clearing house for multilingual forest terminology and promotes the development of an enhanced common understanding

of forest-related terms and definitions, their possible harmonization and proper use. By this means, the SilvaVoc Terminology Project also provides a basis for more coordinated and streamlined forest-related reporting to international conventions and organizations.

74. The recent International Conference on Criteria and Indicators meeting also gave strong emphasis to the need for improving the capacity of developing countries and countries with economies in transition for national data collection, analysis and reporting. The scientific and technological community contributes to this task through specific training measures. For example, the International Union of Forest Research Organizations (IUFRO), the Tropical Agricultural Research and Training Center (CATIE) and the Centre for International Forestry Research (CIFOR), in technical cooperation with FAO, are currently preparing an expert meeting entitled "Capacity-building for forest scientists in Latin America in criteria and indicators, auditing of sustainable forest management and forest certification", to be held in May 2003 in Costa Rica. The results of the proposed expert consultation will help to design further training modules that are beneficial to scientists from developing countries and tailored to the regional context.

75. As another activity facilitating international efforts concerning monitoring, assessment and reporting, the Global Forest Information Service (GFIS) has been established with the aim to serve as an Internet-based search engine using metadata to provide access to forest information. The resulting system serves as a resource discovery tool, providing multiple benefits to information users and providers including facilitating user-friendly access to a greater amount of forest-related information. Particular emphasis is placed on including developing countries in the service. The prototype of GFIS, launched in August 2002, consists of 12 nodes in Africa, Asia, Australia and Europe. The multi-host search engine is capable of performing search operations across a distributed network of metadata over available information resources.

76. Finally, the scientific and technological community has also been involved in several other multinational initiatives and processes related to monitoring, assessment and reporting, including the United Nations Food and Agriculture Organization/Economic Commission for Europe Global Forest Resources Assessment 2000 and the United Nations-Intergovernmental Panel on Climate Change.

Proposed actions for policy and decision makers

77. Forest policy and decision makers are called upon to:

(a) Make best use of scientific and technological expertise for the development of approved means for monitoring, assessment and reporting, including the scientific work addressing the concept of national forest programmes, the improvement of regional, national and subnational sets of criteria and indicators for sustainable forest management and monitoring, assessment and reporting related to policy commitments;

(b) Fully utilize the supporting role of the scientific and technological community in the enhancement of the common understanding and possible harmonization of forest-related terms and definitions; and to recognize the role of

science and technology in facilitating the compilation and storage of forest-related data and information and in providing access to forest information;

(c) Make best use of and further support the role of the scientific and technological community in improving the capacity of developing countries and countries with economies in transition for national data collection, analysis and reporting.

VIII. Final considerations and conclusions

78. Science and technology are essential factors for the successful implementation of the IPF/IFF proposals for action as well as the Forum's multi-year programme of work and plan of action. Policy and decision makers are therefore called upon to make best use of available science and technology and take fully into account the proposed actions related to "economic aspects of forests", including "trade", "forest health and productivity" and "maintaining forest cover to meet present and future needs".

79. However, enhancing the scientific and technological community's capacity to contribute to sustainable development will also require significant changes. The scientific and technological community is committed to further strengthen its capacity to contribute to sustainable forest management and, thereby, to overall sustainable development. There is a need to provide more policy-relevant, problem-oriented research that addresses the social, economic, and environmental dimensions of sustainable forest management and their various linkages and interactions. To this end, the scientific and technological community is committed to further expand multidisciplinary research by means of increased networking and collaboration, bridging traditional disciplinary divides and crossing sectoral boundaries.

80. Furthermore, the scientific and technological community recognizes the need to build and enhance strong scientific and technological capacity in all regions of the world, including North-North, North-South and South-South cooperation and partnerships. Sharing of knowledge, information and technology based on widely available and affordable mechanisms constitutes a crucial task to this end. However, this has to build on appropriate support for the scientific and technological community, especially in the area of scientific and technological capacity-building.

81. Strong partnership between the scientific and technological community and other members of civil society, the private sector and Governments is of fundamental importance to further enhance the contribution of science and technology to achieving sustainable forest management, and to ensure policy relevant science. The scientific and technological community is committed to implementing necessary changes and developing appropriate partnerships. Reference can be made in this context to the contributions of the scientific and technological community to the multi-stakeholder dialogues at the second session of the Forum and the Summit.

82. At the same time, the scientific and technological community needs to count on more sound and sustained financial support if it is to be successful in facing the challenges for the sustainable management of the world's forests. In particular, there is an urgent need to reverse the ongoing trend of reducing financing and investment in research and higher education, as observed, unfortunately, in an increasing number of countries around the world. Public and private inputs into science and technology should be seen primarily as an investment in forest-related socio-economic development and in preserving forests as natural life-support systems for present and future generations, rather than simply as research expenditures.